

REMARKS

The following remarks are provided in response to the Office Action mailed November 18, 2005 in which the Examiner:

- objected to the drawings because they included hand drawn figures and figure numbers.
- rejected claims 1-8 and 10 under 35 U.S.C. §102(e) as being anticipated by US 6,794,281 to Madhukar et al. (hereinafter Madhukar).
- rejected claim 9 under 35 U.S.C. §103(a) as being unpatentable over Madhukar in view of US 6,255,698 to Gardner et al. (hereinafter Gardner).
- rejected claims 11-20 under 35 U.S.C. §103(a) as being unpatentable over Madhukar in view of US 2003/0201121 to Jeng (hereinafter Jeng).

The applicants respectfully request reconsideration of the above referenced patent application for the following reasons:

Objection to Drawings

The Examiner required replacement drawings, in compliance with 37 C.F.R. §1.121(d), because they included hand drawn figures and figure numbers. The applicants respectfully request that the Examiner consider the replacement drawings provided herein.

Claim 1-8 and 10 rejection under 35 U.S.C. §102(e)

Claims 1-8 and 10 are rejected under 35 U.S.C. §102(e) as being anticipated by

Madhukar. The applicants herein amend independent claim 1 (on which claims 2-8 and 10 depend) and respectfully request reconsideration of claims 1-8 and 10 in view of the amendments and the following arguments.

In claims 1-8 and 10, the applicants teach and claim a method for making a semiconductor device comprising forming a first dielectric layer on a substrate and forming a trench within said first dielectric layer, wherein said trench is formed by removing a mask layer and a polysilicon layer. The mask layer protects the polysilicon layer during a previous silicide process. By blocking the silicidation of the polysilicon layer, the polysilicon layer is easier to remove selectively at the time of the trench formation step.

As the Examiner points out, Madhukar discloses a method for making a semiconductor device comprising forming a first dielectric layer **162** on a substrate **102**, forming a trench in the dielectric layer (Figure 6C), forming a second dielectric layer **108** on the substrate and in the trench, forming a first metal layer **110** on the first part of the second dielectric layer but not covering the second part of the second dielectric layer (Figure 6D), and forming a second metal layer **114** on the first metal layer and on the second part of the second dielectric layer (Figure 6E). However, Madhukar does not disclose a method wherein a trench is formed by removing a mask layer and a polysilicon layer, wherein the mask layer protects the polysilicon layer in a silicide process, as taught by the applicants.

Claim 9 rejection under 35 U.S.C. §103(a)

Claim 9 is dependent on independent claim 1. In view of amended independent claim 1 discussed above, the applicants request that claim 9 be reconsidered.

Claims 11-20 rejection under 35 U.S.C. §103(a)

Claims 11-20 are rejected under 35 U.S.C. §102(e) as being unpatentable over Madhukar in view of Jeng. Claim 11 is dependent on independent claim 1. In view of amended independent claim 1 discussed above, the applicants request that claim 11 be reconsidered. The applicants herein respectfully request reconsideration of claims 12-20 in view of the amendments and following arguments.

With respect to claims 12-20, the applicants teach and claim a method for making a semiconductor device comprising forming a first metal layer comprised of a first part in a trench and a second part, forming a spin on glass layer on said first metal layer, a first part of said spin on glass layer covering said first part of said first metal layer in said trench and a second part of said spin on glass layer covering said second part of said first metal layer. The second part of said spin on glass layer is removed while said first part of said spin on glass layer is retained, exposing said second part of said first metal layer. The second part of said first metal layer is removed and then said first part of said spin on glass layer is removed, exposing said first part of said first metal layer. A second metal layer is then formed, covering said first metal layer. Thus, a spin on glass layer is used as a mask in a trench for a metal patterning process, wherein a portion of the metal layer being patterned is at the bottom of a pre-formed trench.

As the Examiner points out, Madhukar teaches a method of forming the first metal layer by depositing the first metal layer, masking and etching the metal over the second part of the dielectric layer, and removing the masking layer [column 3, lines 5-20]. As the Examiner also points out, Madhukar does not disclose a method of using a spin on glass layer as a mask in a metal patterning process, as taught by the applicants.

As the Examiner points out, Jeng discloses a method of using of a spin on glass layer **56** as a mask for a metal lithography process [0048]. The spin on glass layer **56** acts as a hardmask during the metal layer **38** etch process, wherein the metal layer lies flat on a non-patterned silicon substrate and the spin on glass layer lies flat on the metal layer [0048, Figs. 7-10]. Thus, the thickness of the spin on glass layer is the same above all portions of the metal layer (Figs. 7-10). Jeng does not disclose a method of using a spin on glass layer to pattern a metal layer that in part resides in a trench, wherein the thickness of the spin on glass layer above the metal layer varies as a result of the topography of the trench, as taught by the applicants. In the method taught by the applicants, the spin on glass layer has a flat top surface but has a thicker depth in locations where it fills a trench and a shallower depth in locations where a trench has not been formed. The flat top surface of the spin on glass layer enables a topographical masking process, wherein the spin on glass layer is patterned within a trench and subsequently used as a topographical mask for the patterning of a metal layer, and wherein the metal layer is conformal to the topography of a pre-formed trench. Thus, the properties of the spin on glass layer are exploited to conformally fill a pre-formed trench while retaining a flat top surface to enable a masking/lithography process.

Thus, neither Madhukar nor Jeng alone or in combination disclose a method of making a semiconductor device wherein a spin on glass layer is used as a mask for a metal lithography process at the bottom of a pre-formed trench, as taught by the applicants.

New Claims 21-48

The applicants herein add new claims 21-48 and submit that they have the right to claim the invention as set forth in the new claims.

Claim 21-25 are dependent on independent claim 1. In view of amended independent claim 1 discussed above, the applicants request that claims 21-25 be reconsidered. Claim 26-31 are dependent on independent claim 12. In view of amended independent claim 12 discussed above, the applicants request that claims 26-31 be reconsidered. Claim 32-35 are dependent on independent claim 16. In view of amended independent claim 16 discussed above, the applicants request that claims 32-35 be reconsidered.

With respect to claims 36-39, none of Madhukar, Gardner nor Jeng alone or in combination disclose a method wherein a trench is formed by removing a mask layer and a polysilicon layer, wherein the mask layer protects the polysilicon layer from being silicided during a silicide process, as taught by the applicants. With respect to claims 40-43, none of Madhukar, Gardner nor Jeng alone or in combination disclose a method of making a semiconductor device comprising forming a first metal layer at the bottom of a trench, patterning said first metal layer within said trench such that a portion of the

bottom of said trench is exposed, and then forming a second metal layer at the bottom of the same trench and covering said first metal layer, wherein said second metal layer comprises a different material than said first metal layer, as taught by the applicants.

With respect to claims 44-48, none of Madhukar, Gardner nor Jeng alone or in combination disclose a method of making a semiconductor device wherein a spin on glass layer is used as a mask in a trench for a metal patterning process, as taught by the applicants.

CONCLUSION

The applicants submit that they have overcome the Examiner's rejections of the claims and objections to the drawings and that they have the right to claim the invention as set forth in the listed claims. The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

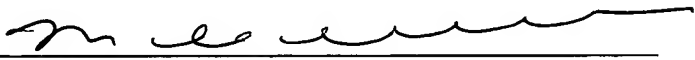
Pursuant to 37 C.F.R. 1.136(a)(3), applicant(s) hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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1/18/06
Dated

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